FLIGHT SUMMARY REPORT

Flight Number: 94-153

Calendar/Julian Date: 27 September 1994 • 270

Sensor Package: Wild-Heerbrug RC-10
Airborne Visible and Infrared Imaging Spectrometer (AVIRIS)
Modis Airborne Simulator (MAS)

Area(s) Covered: East Oregon/Idaho

Investigator(s): Kaufman, GSFC **Aircraft #:** 706

SENSOR DATA

Accession #:	04826	-----	-----
Sensor ID #:	034	099	108
Sensor Type:	RC-10	AVIRIS	MAS
Focal Length:	12" 304.66 mm	-----	-----
Film Type:	Aerochrome IR SO-060	-----	-----
Filtration:	Wratten 12	-----	-----
Spectral Band:	510-900 nm	-----	-----
f Stop:	8	-----	-----
Shutter Speed:	1/125	-----	-----
# of Frames:	82	-----	-----
% Overlap:	60	-----	-----
Quality:	Good	-----	Good
Remarks:	Camera clock offset 21.1 seconds from navigation data		

Airborne Science and Applications Program

The Airborne Science and Applications Program (ASAP) is supported by three ER-2 high altitude Earth Resources Survey aircraft. These aircraft are operated by the High Altitude Missions Branch at NASA-Ames Research Center, Moffett Field, California. The ER-2s are used as readily deployable high altitude sensor platforms to collect remote sensing and *in situ* data on earth resources, celestial phenomena, atmospheric dynamics, and oceanic processes. Additionally, these aircraft are used for electronic sensor research and development and satellite investigative support.

The ER-2s are flown from various deployment sites in support of scientific research sponsored by NASA and other federal, state, university, and industry investigators. Data are collected from deployment sites in Kansas, Texas, Virginia, Florida, and Alaska. Cooperative international scientific projects have deployed the aircraft to sites in Great Britain, Australia, Chile, and Norway.

Photographic and digital imaging sensors are flown aboard the ER-2s in support of research objectives defined by the sponsoring investigators. High resolution mapping cameras and digital multispectral imaging sensors are utilized in a variety of configurations in the ER-2s' four pressurized experiment compartments. The following provides a description of the digital multispectral sensor(s) and camera(s) used for data collection during this flight.

Airborne Visible and Infrared Imaging Spectrometer

The Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) is the second in the series of imaging spectrometer instruments developed at the Jet Propulsion Laboratory (JPL) for earth remote sensing. This instrument uses scanning optics and four spectrometers to image a 614 pixel swath simultaneously in 224 contiguous spectral bands (0.4-2.4 μm).

AVIRIS parameters are as follows:

IFOV:	1 mrad
Ground Resolution:	66 feet (20 meters) at 65,000 feet
Total Scan Angle:	30°
Swath Width:	5.7 nmi (10.6 km) at 65,000 feet
Spectral Coverage:	0.41-2.45 μm
Pixels/Scan Line:	614
Number of Spectral Bands:	224
Digitization:	10-bits
Data Rate:	17 MBPS

Spectrometer	Wavelength Range	Number of Bands	Sampling Interval
1	0.41 - 0.70 μm	31	9.4 nm
2	0.68 - 1.27 μm	63	9.4 nm
3	1.25 - 1.86 μm	63	9.7 nm
4	1.84 - 2.45 μm	63	9.7 nm

All AVIRIS data is decommutated and archived at JPL and not currently available for public distribution. For further information contact Rob Green at Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 183-501, Pasadena, California 91109-8099.

Modis Airborne Simulator

The Modis Airborne Simulator (MAS) is a modified Daedalus multispectral scanner. It records up to twelve 8-bit channels, which can be selected from an array of fifty available spectral bands. The band selection is made prior to flight and the instrument is hard-wired to that configuration. Channel 1 is used to store additional bits which provide 10-bit resolution for channels 9 through 12. The following MAS band combination (configuration SCAR-C) was used on this flight for SCAR-C data acquisition:

Data System Channel	MAS Channel	Band edges µm
1	--	-------
2	1	0.529 - 0.572
3	10	1.595 - 1.652
4	10	1.595 - 1.652
5	15	1.855 - 1.905
6	20	2.126 - 2.173
7	46	11.799 - 12.246
8	32	3.825 - 3.975
9*	2	0.635 - 0.688
10*	7	0.852 - 0.893
11*	45	10.791 - 11.239
12*	32	3.825 - 3.975

* 10-bit resolution

Sensor/Aircraft Parameters:

Spectral Channels:	50
Output Channels:	Seven 8-bit and four 10-bit
IFOV:	2.5 mrad
Ground Resolution:	163 feet (50 meters at 65,000 feet)
Total Scan Angle:	85.92°
Pixels/Scan Line:	716
Scan Rate:	6.25 scans/second
Ground Speed:	400 kts (206 m/second)
Roll Correction:	Plus or minus 3.5 degrees (approx.)

Camera Systems

Various camera systems and films are used for photographic data collection. Film types include high definition color infrared, natural color, and black and white emulsions. Available photographic systems are as follows:

- Wild-Heerbrug RC-10 metric mapping camera
  - 9 x 9 inch film format
  - 6 inch focal length lens provides area coverage of 16 x 16 nautical miles from 65,000 feet
  - 12 inch focal length lens provides area coverage of 8 x 8 nautical miles from 65,000 feet
- Hycon HR-732 large scale mapping camera
  - 9 x 18 inch film format

- 24 inch focal length lens provides area coverage of 4 x 8 nautical miles from 65,000 feet

- IRIS II Panoramic camera
  - 4.5 x 34.7 inch film format
  - 24 inch focal length lens
  - 90 degree field of view provides area coverage of 2 x 21.4 nautical miles from 65,000 feet

The U.S. Geological Survey's EROS Data Center at Sioux Falls, South Dakota serves as the archive and product distribution facility for NASA-Ames aircraft acquired photographic and digital imagery. For information regarding photography and digital data (including areas of coverage, products, and product costs) contact EROS Data Center, Customer Services, Sioux Falls, South Dakota 57198 (Telephone: 605-594-6151).

For specific information regarding flight documentation, sensor parameters, and areas of coverage contact the Aircraft Data Facility, NASA-Ames Research Center, Mail Stop 240-6, Moffett Field, California 94035-1000 (Telephone: 415-604-6252). Additional information regarding ER-2 acquired photographic and digital data is also available through the Aircraft Data Facility.

CAMERA FLIGHT LINE DATA
FLIGHT NO. 94-153

Accession # 04826

Sensor # 034

Check Points	Frame Numbers	Time (GMT-hr, min, sec) START	Time (GMT-hr, min, sec) END	Altitude, MSL feet/meters	Cloud Cover/Remarks
A - B	7362-7366	22:19:26	22:21:20	65000/19800	Clear
C - D	7367-7380	22:37:02	22:43:14	"	10-40% smoke and cumulus (frames 7367-7370); 80-100% smoke and cumulus (frames 7371-7380)
E - F	7381-7390	22:53:00	22:57:17	"	Minor smoke (frame 7381); 30-50% smoke and cumulus (frames 7382-7390)
G - H	7391-7399	23:04:45	23:08:34	"	Minor-10% smoke (frames 7391 and 7394); 40-80% smoke and cumulus (frames 7395-7399)
I - J	7400-7408	23:14:07	23:17:56	"	30% smoke and cumulus (frame 7400); 70-100% smoke and cumulus (frames 7401-7408)
K - L	7409-7422	23:25:44	23:31:56	"	40-100% smoke and cumulus
M - N	7423-7432	23:35:49	23:40:07	"	20% smoke (frame 7423); 40-90% smoke and cumulus (frames 7424-7432)

CAMERA FLIGHT LINE DATA
FLIGHT NO. 94-153

Accession # 04826

Sensor # 034

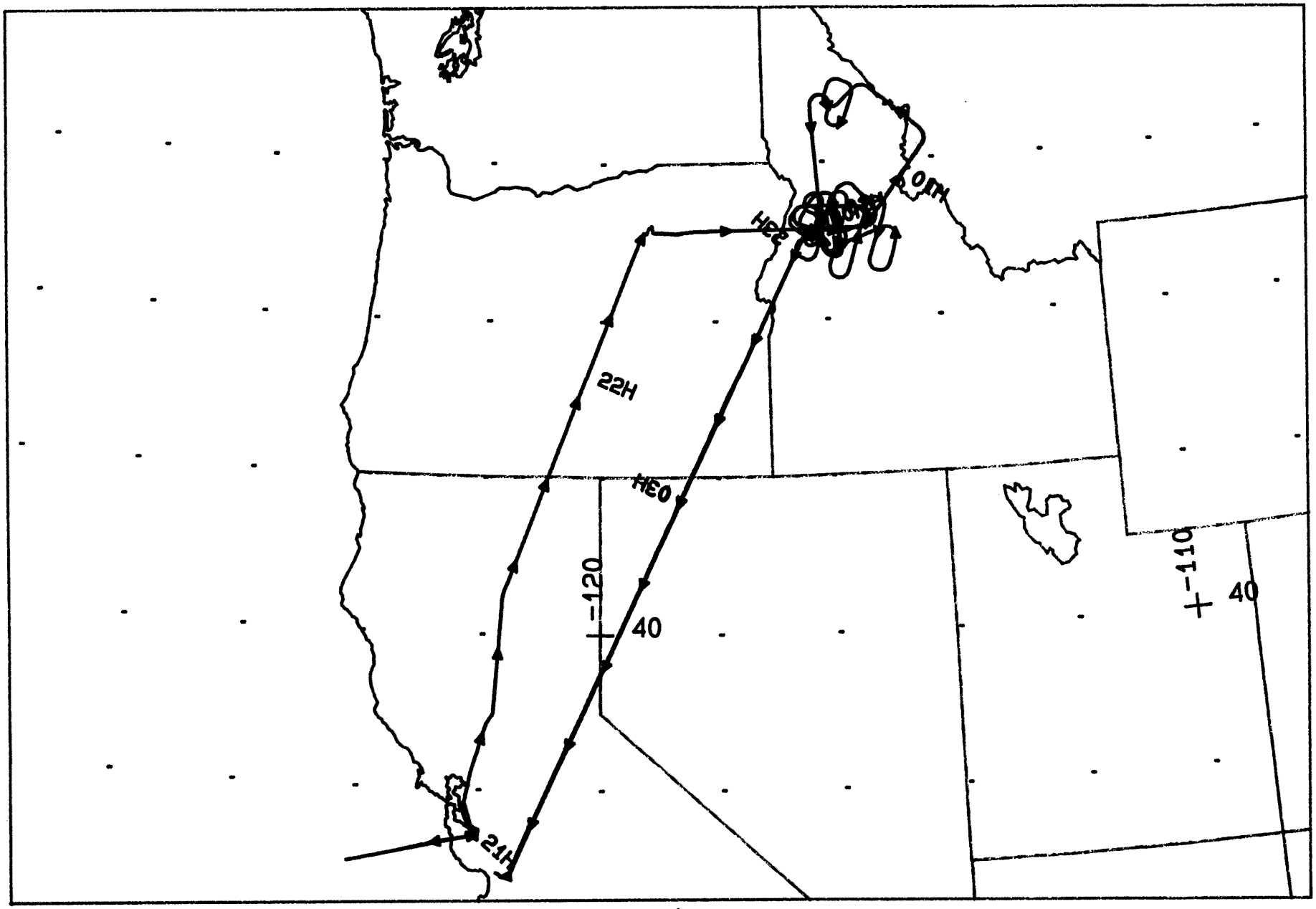
Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
O - P	7433-7438	23:45:29	23:47:52	65000/19800	30% smoke and cumulus
Q - R	7439-7443	23:58:39	0:00:33	"	10-50% smoke and cumulus

MAS SCANNER FLIGHT LINE DATA

FLIGHT NO. 94-153

DAEDALUS FLIGHT DATA
FLIGHT NUMBER: 94-153

Check Points	Actual time (GMT) begin	Actual time (GMT) end	Actual scanline begin	Actual scanline end	Altitude feet/meter	Scan Speed (rps)	total Good scanlines	total Interpolated scanlines	total Repeated scanlines
A-B	22:18:50.0	22:21:13.0	16187	17078	65000/19812	6.25	892	0	0
C-D	22:36: 5.0	22:43:31.0	22622	25394	65000/19812	6.25	2773	0	0
E-F	22:52:32.0	22:57:19.0	28760	30542	65000/19812	6.25	1783	0	0
G-H	23:04:13.0	23:10:19.0	33116	35393	65000/19812	6.25	2278	0	0
I-J	23:13:46.0	23:20:24.0	36680	39155	65000/19812	6.25	2476	0	0
K-L	23:24:23.0	23:32: 5.0	40640	43511	65000/19812	6.25	2872	0	0
M-N	23:35:32.0	23:40:50.0	44798	46778	65000/19812	6.25	1981	0	0
O-P	23:44:49.0	23:47:44.0	48263	49352	65000/19812	6.25	1090	0	0
Q-R	23:57:49.0	00:01: 0.0	53114	54302	65000/19812	6.25	1189	0	0
H-G	00:07:38.0	00:11: 5.0	56777	58064	65000/19812	6.25	1288	0	0
F-H	00:14:32.0	00:18:15.0	59351	60737	65000/19812	6.25	1387	0	0
F-S	00:27:33.0	00:30:12.0	64202	65192	65000/19812	6.25	991	0	0
Q-R	00:36:34.0	00:39:29.0	67568	68657	65000/19812	6.25	1090	0	0
F-S	00:46:23.0	00:49:34.0	71231	72419	65000/19812	6.25	1189	0	0
S-D	00:50:54.0	00:53: 1.0	72914	73706	65000/19812	6.25	793	0	0
R-Q	01:49: 1.0	01:53:16.0	94595	96179	65000/19812	6.25	1585	0	0
T-U	01:56:59.0	02:00:26.0	97565	98852	65000/19812	6.25	1288	0	0
F-H	02:10:31.0	02:13:58.0	102614	103901	65000/19812	6.25	1288	0	0
F-O	02:21: 8.0	02:26:11.0	106574	108455	65000/19812	6.25	1882	0	0



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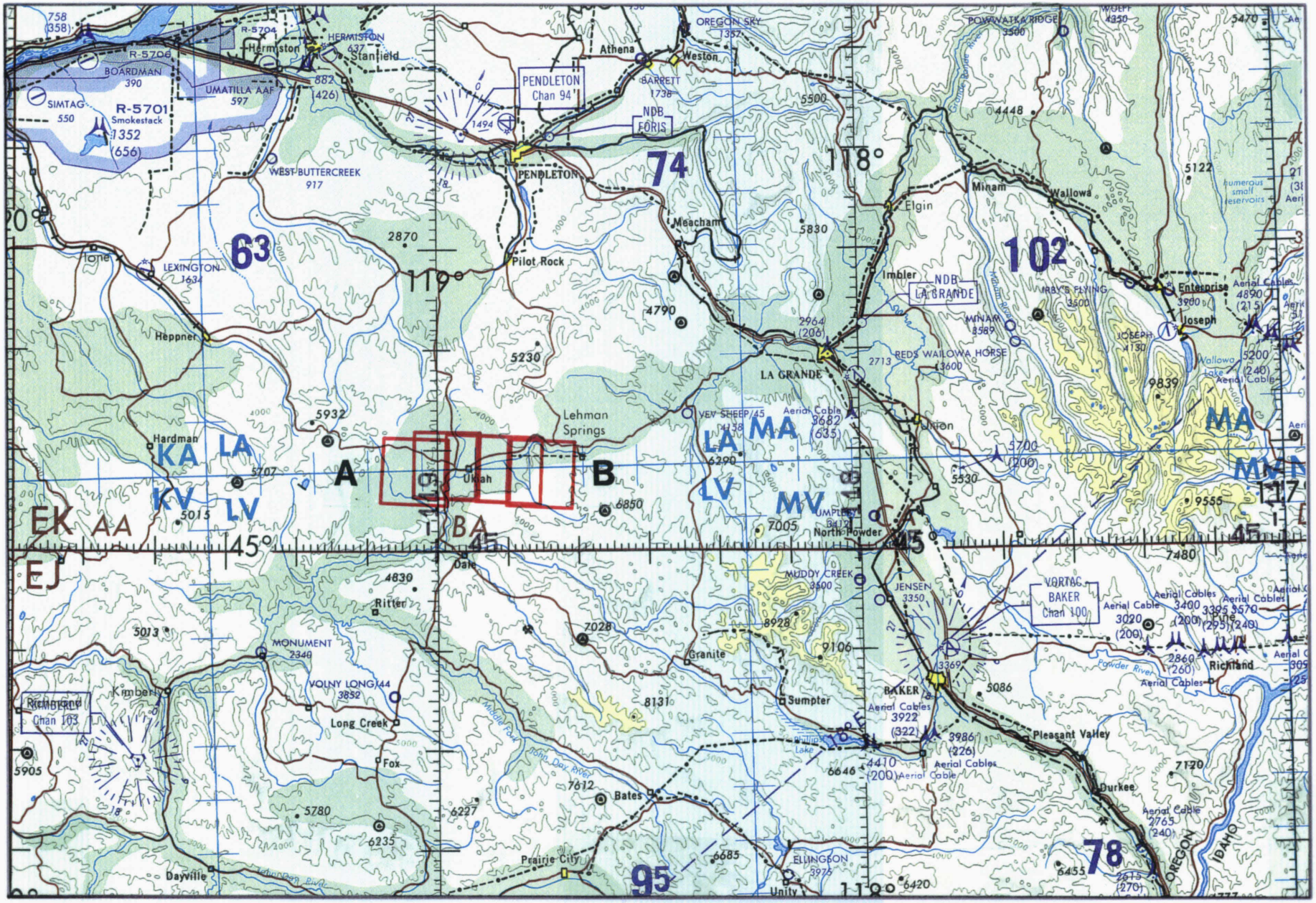

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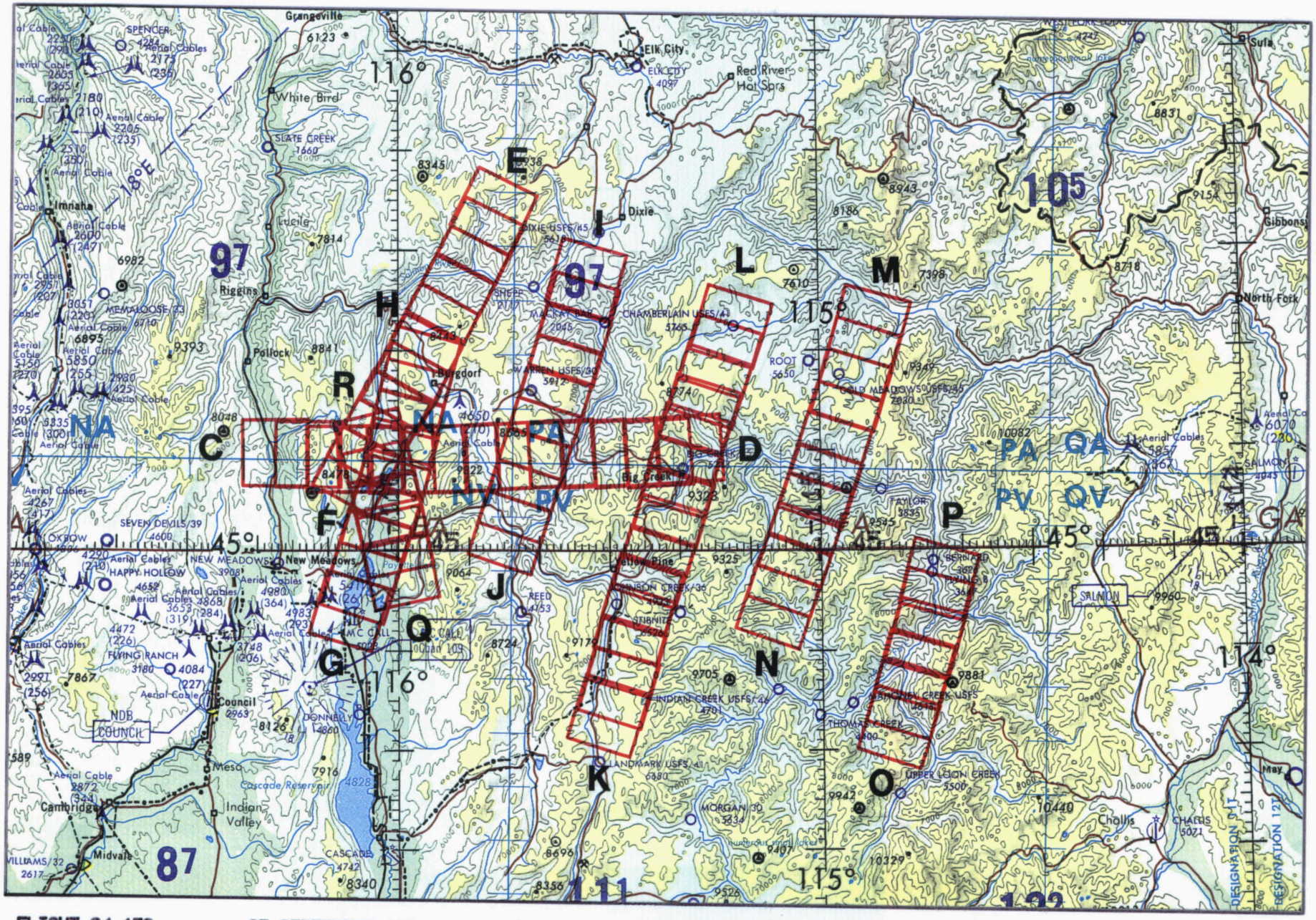

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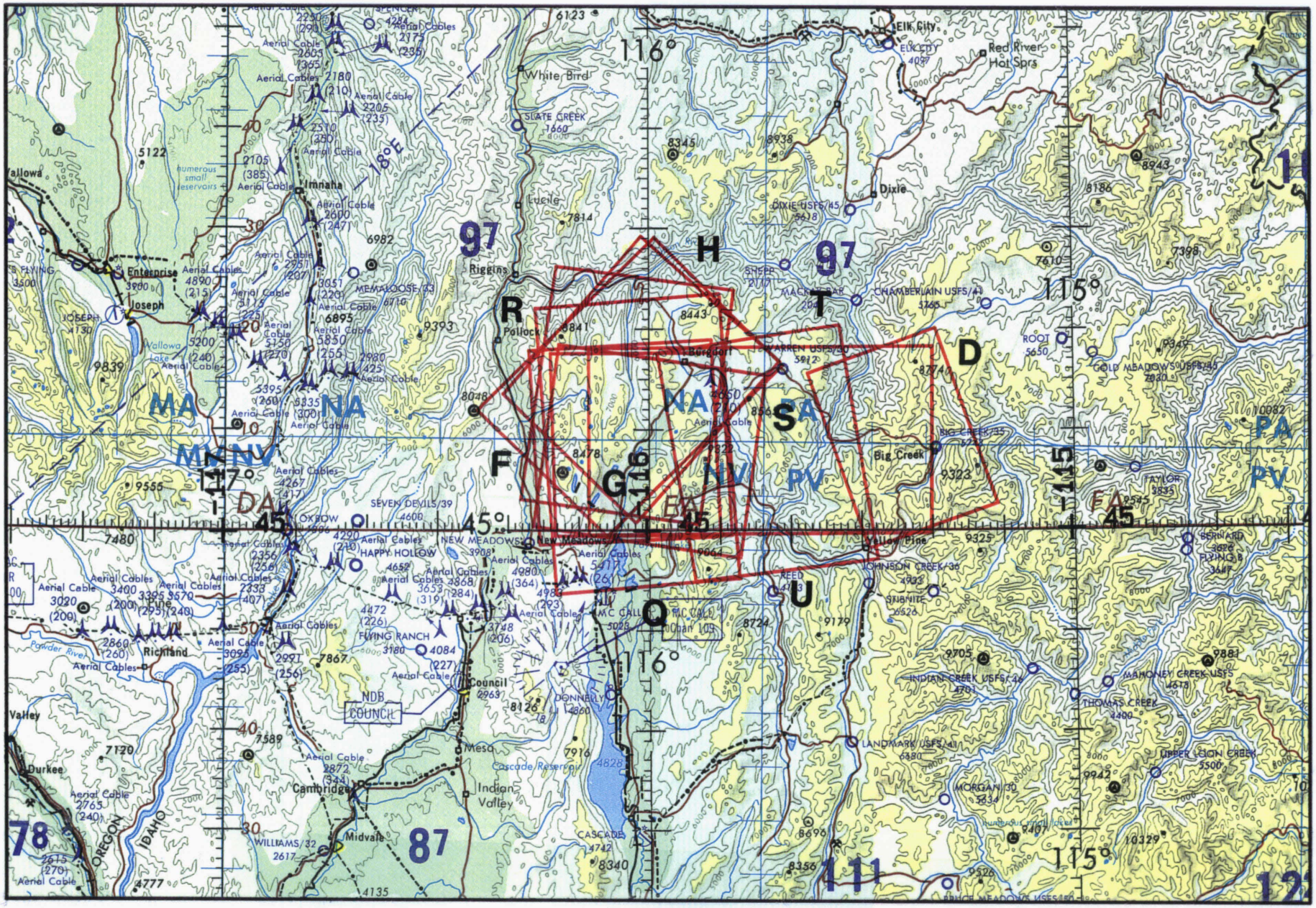

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